

far in advance of the museum of 1847; but it in turn will be old-fashioned by the end of twenty years, and when the coming (= present) century is half-way through, its methods and arrangements will probably be wholly superseded by something better."

With these words we take leave of a very instructive and fascinating book, which it may be hoped will in some measure serve to awaken greater public interest in museums, and thereby enable them to receive adequate financial support from those responsible for their management.

R. L.

ELEMENTARY PHYSIOLOGY.

- (1) *A Primer of Physiology.* By Prof. E. H. Starling, F.R.S. Pp. viii+128. (London: John Murray, 1904.) Price 1s.
- (2) *Elementary Practical Physiology.* By John Thornton, M.A. Pp. viii+324. (London: Longmans, Green and Co., 1904.) Price 3s. 6d.

(1) **A**SSUMING an elementary knowledge of the main facts of chemistry and physics on the part of the readers, Prof. Starling has endeavoured to present with as few technical terms as possible the leading ideas which make up present-day physiology.

It is clear that within the limited space of about 120 short pages the accomplishment of such a task is well-nigh impossible, and except in the accuracy of the stated facts due to the author's mastership of his subject, we do not think that the present attempt is more successful than those of others which have preceded it.

The great difficulty in writing such diminutive primers does not lie in the direction of finding matter to insert, but in a superabundance of material which must be left out if the reader is not to be stifled by a congested mass of facts crammed together into the shortest possible space, and as a consequence expressed in the tersest and baldest of language.

It is the difficulty of freeing the mind from the bondage of detail and dealing only with broad outlines which makes such primers dry and uninteresting reading, and causes one to sympathise with the children who are forced to read and to attempt to digest them mentally.

The primer at present under consideration is no worse, and perhaps somewhat better, in this respect than many similar productions; still, it would have served its purpose better if much of the detail had been left out, and room so provided for more ample treatment of the prominent and important aspects of the subject.

In the small amount of space at his disposal the author deals not only with the anatomy and physiology of the mammal, but finds room for some instruction regarding toxins and antitoxins, and a short chapter upon the defence of the body against micro-organisms. The introductory chapter takes up the consideration of the animal as a thermodynamic machine, includes the famous candle-burning experiment and the use of the calorimeter, and then passes rapidly to adaptive reactions, adaptation to poisons, and finally to antitoxins, thus showing that the whole of life is a series of adapted reactions.

In this chapter even the junior chemist who may read the primer will object to the illustration which shows him soda-lime as a fluid in bottles 1 and 4 of the illustration on p. 5, and it is to be feared that the junior physicist will be inclined to regard the calorimeter shown in section on p. 8 as a somewhat impossible piece of apparatus.

The remaining chapters furnish accounts of structure, food, digestion, circulation of the blood, breathing, exertion, the skin and its uses, the history of the food in the body, the chemical factories of the body, the defence of the body against micro-organisms, the physiology of movement and the muscles, the central nervous system, feelings—the whole contained in 112 brief pages, and forming a veritable *multum in parvo*.

(2) It is somewhat difficult on first glancing through Mr. Thornton's book to understand why the word *practical* appears on its title-page, for by far the greater part of the text is purely descriptive, although at intervals directions for simple dissections and experiments are interspersed in an unobtrusive manner.

On looking at the page opposite to the descriptive title page, however, one discovers that it is a member of the "Practical Elementary Science Series" issued by the publishers, and intended, as the author states in his preface, to meet all the requirements of stage 1 (the elementary stage) as set forth in the syllabus issued by the Board of Education, and in similar syllabuses of other examining bodies. Hence both the "elementary" and the "practical" of the title form, so to speak, the "class name" of the series, and are suggested by the syllabus and examination which have evidently given rise to their existence.

It is, in the opinion of the reviewer, a pity that even elementary text-books of science should have to be written to suit the requirements of syllabuses and examinations, but it appears to be inevitable in view of the artificial manner in which a love of science is propagated in this country that the majority of our text-books must be so written.

It accordingly becomes a problem whether such books can best be written by experts engaged upon the particular subject treated, or by the schoolmasters engaged in teaching that subject along with others.

The schoolmaster can claim the advantage in that he is a teacher of children, and knows best how to put the subject so that they will understand it; also, being engaged year after year in preparing pupils for the examination, he knows the requirements of the situation so far as success in the examination is concerned; but his knowledge of the subject and his presentation of it must be chiefly second-hand, since the prosecution of the study is not his daily occupation. On the other hand, the specialist, while he can give a review of the subject from a living acquaintance with it, may fail signally in writing to suit the requirements of the syllabus and the examination, disappoint both teacher and scholars in this respect, and leave his publisher without a market.

The book before us will lead to no disaster in

examination results, as a comparison of the sets of examination papers included at the end of the volume with the text of the book amply demonstrates, and it must be added that if an observant student carries out the simple experiments so clearly described at various places in the volume, he will have acquired a very desirable knowledge of the more important features of physiology. But so much cannot be said of the remainder of the text, which aims at far too much statement of detail for the space available, a matter in which the syllabus may be much more to blame than the author.

For example, the student who has learnt no chemistry previously will not be able to digest much from the description of the chemical elements given in a single page, and the same is true of the description of the chief inorganic compounds and the organic compounds of the body, each dismissed in less than a page.

The valuable habit of coordinating knowledge in the form of tables is visible at places in the book, but summaries have a way of becoming either too sweeping or too inexact, and we fear that the pupil, especially after such a concise training in chemistry as we have just indicated, may be in danger of concluding from a perusal of the table on p. 13 that the body contains "mineral salts" formed from a very strange combination of elements, or, from the table on p. 162, that these same "mineral matters" share only "in forming bone and assist in digestion," and not that they are found in every cell and tissue in the body, and form as essential a constituent there as the all-important proteids, which are in the same table represented as the only tissue formers.

B. MOORE.

TERRESTRIAL MAGNETISM.

Terrestrial Magnetism and its Causes. By F. A. Black. Pp. xii+226. (London and Edinburgh: Gall and Inglis, 1905.) Price 6s. net.

WITH regard to the earth's magnetism, the general conclusions from observations made on its surface are that it is partly permanent, partly induced, and subject to the effects of electric currents in the earth's crust and the surrounding atmosphere. Moreover, that the direct action of the sun plays a comparatively subordinate part in producing the observed phenomena.

In this book, however, various reasons are submitted for the belief that the general magnetism of the earth, and the constant changes thereof as shown by the hourly variations of the needle, are due to causes external to the earth. In short, that the earth is to be considered as an electromagnet excited by electric currents proceeding from the sun and impelled towards the earth with inconceivable rapidity, the orbital and axial movements of the earth through these currents producing magnetic effects in a manner similar to the winding of an electromagnet through which a current passes.

In order that we may believe this to be the case, we must agree that the sun gives out electric waves continuously in every direction equal to the work of

maintaining the earth as an electromagnet. For example, that during the forty-five years of the last century, when, according to computation from observed facts, the earth's magnetic moment hardly changed, these emanations were continuous. At present there does not appear to be any ground for such a belief.

In an endeavour to explain the hourly angular variations of the needle, it is submitted that the earth's magnetic poles probably occupy a considerable area round the centre of which certain centres of primary attraction in them make a daily circuit, due to the action of the sun as the earth rotates on its axis. In addition to the "primary" magnetic pole in North America, it is suggested that a "secondary" pole of a similar nature must exist in northern Siberia. The daily variations of the needle, both in declination and dip, in the northern hemisphere are then attributed to a battle for the mastery between the revolving centres of attraction in the two poles mentioned, modified as the magnetic equator is approached by the attraction of the south magnetic poles.

As one reads through several of the first chapters the fully expressed acceptance of the idea that the attraction of the needle by the magnetic poles is the immediate cause of its variations seems unaccountable, until a fundamental error is reached. This is when the author takes it as generally agreed that, in the same way as steel is attracted by the poles of an ordinary artificial magnet, the magnetic needle is attracted by the poles of that great natural magnet, the earth. Such a statement vitiates whole pages of the arguments adduced.

On the question of the position of the magnetic equator with regard to the terrestrial equator, the results of observation have also been too much ignored. There have not been four crossings of the two equators during the last sixty years, neither are the two known points of crossing regulated by the position of the magnetic poles as suggested. In the Atlantic region, the point of crossing seems to be chiefly regulated by local causes below the earth's surface.

It may be finally remarked that the chapter on magnetic storms is the most acceptable in the book.

OUR BOOK SHELF.

Mechanical Appliances, Mechanical Movements and Novelties of Construction. By Gardner D. Hiscox. Pp. 396. (London: Constable and Co., Ltd., 1905.) Price 12s. 6d. net.

THIS book is luxuriously printed, with clear figures, but it is difficult to say more in its praise. It consists of a series of short paragraphs, each with its illustration, describing some mechanical or constructional device. It is similar in plan to those "Centuries of Invention" of which the Marquis of Worcester's was the earliest (1746). The devices described are of the most heterogeneous character, old and new, important and unimportant, useful and useless. They are arranged in the roughest way in sections which have no relation to any natural order of classification. It is difficult to see to whom such a work appeals, but in fairness to the author it should be stated that a previous work